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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,464	01/09/2006	Hiroyuki Fujimura	2060.3	2774
7590	10/03/2007			
Robert H Hammer III Suite I 3121 Springbank Lane Charlotte, NC 28226			EXAMINER BELL, BRUCE F	
			ART UNIT 1745	PAPER NUMBER
			MAIL DATE 10/03/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,464	<b>Applicant(s)</b> FUJIMURA ET AL.	
	<b>Examiner</b> Bruce F. Bell	<b>Art Unit</b> 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some    \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s).

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>11/21/05</u> . | 6) <input type="checkbox"/> Other: ____.  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Johnson et al (5686152).

Johnson et al discloses a 10 mil thick single crystal silicon substrate that is coated with a polycrystalline diamond coating, where the coating is about 1 micron thick. See example 22.

The prior art of Johnson et al anticipates the applicants instant invention as shown by way of the disclosure to Johnson et al set forth above.

***Claim Rejections - 35 USC § 103***

3. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobashi et al (5352908) or Dreifus et al (5173761) in combination with Burke (5423475).

Kobashi et al disclose a diode having a low resistance silicon substrate 1, a boron doped polycrystalline p-type semiconducting diamond layer 2 on the silicon substrate 1, an insulating diamond layer 3 on the doped diamond layer 2 and an ohmic copper electrode 5 and an aluminum electrode 4 both on the insulating diamond layer 3. See example 1.

Dreifus et al disclose a p-type silicon substrate on which is deposited a boron doped diamond layer on which an undoped diamond layer is deposited, with an aluminum electrode deposited on the undoped diamond layer. See figure 2 and col. 3, lines 1-56.

Neither Kobashi et al or Dreifus et al disclose that the silicon substrate is 500 microns or less in thickness.

Burke disclose an aluminum body having a diamond bonded thereto with a diffused interlayer of silicon. See abstract. Burke discloses that diamond films are grown on silicon substrates under high temperature conditions and that the silicon substrates are thinned at room temperature. The thinned silicon layer is bonded by diffusion or brazing to the surfaces of the article to be coated (aluminum body). The resulting structure exhibits excellent metallurgical bonding between the diamond film and the aluminum body which is enriched in silicon near the bond interface. See col. 1, line 62 – col. 2, line 2. The diamond thin film is deposited onto the surface of a clean substrate comprising silicon at a temperature of between 800 to 1000 degrees centigrade by either microwave or plasma deposition. The silicon substrate is an excellent substrate for receiving the diamond film deposit. The silicon of the substrate is removed from the back of the diamond film by chemical etching to produce a diamond film, and the etching is controlled to only partially remove the silicon so that a very thin layer of silicon remains which adheres to the diamond film. See col. 2, lines 15-43. The thinning process is carefully controlled so that at the end of the process, a controlled thin film in the range of 1 to 500 microns remains bonded to the diamond film. The hybrid diamond

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layer/thin silicon layer is then used in a second step for bonding to the surface of the substrate. See col. 2, lines 46-52. The resulting structure is effectively that of a deposited diamond layer over an aluminum body that has a silicon enriched layer near the diamond interface. See col. 2, lines 55-58. Pressure may be applied to the silicon-aluminum layer interface in order to enhance the bonding. See col. 3, lines 9-10.

The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the instant invention was made because even though neither of the prior arts of Kobashi et al or Dreifus et al disclose the silicon substrate being 500 microns or less, the prior art of Burke sets forth that a silicon substrate of this magnitude is known in the art for the purpose of growing diamond films on the silicon substrate and then thinning the silicon substrate after the diamond growth so that the thin silicon substrate layer can be used in bonding the diamond coated silicon to an electrically conductive substrate such as that of aluminum. Therefore, one having ordinary skill in the art would have utilized this teaching of using a grown diamond layer on silicon in the prior arts of Kobashi et al or Dreifus et al to be used as a bonding agent in the making of an electrode that is used in electronic devices, since the process of Burke sets forth that improved bonding occurs between the diamond and silicon as well as between the aluminum substrate and the silicon, which are the same materials as used in the Kobashi et al or Dreifus et al devices.

#### ***Claim Objections***

4. Claims 6, 8 and 9 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

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Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claims 6, 8 and 9 do not further limit the apparatus features of the electrode. The claims on which these claims depend, already set forth that the substrate is bonded to the diamond coated silicon and therefore, the manner in which the diamond layer is bonded to the silicon substrate does not further limit the instant claim unless it can be shown through experimental results, that the overall final product will change as a result of using this specific process. Since no experimental results are present in the instant specification, it appears to the examiner that this is not a criticality of the claimed invention and therefore, does not change the overall final product, absent evidence to the contrary.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bruce F. Bell whose telephone number is 571-272-1296. The examiner can normally be reached on Monday-Friday 6:30 AM - 3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BFB  
September 26, 2007

  
Bruce F. Bell  
Primary Examiner  
Art Unit 1745